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AUTHOR Wallen, Robert N.; MacMillan, Thomas F.
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ABSTRACT

A team of students, faculty members, division chairpersons and administrators at Mendocino College developed a set of knowledge, skill and attitude goals for an interdisciplinary program around the theme of the "World Food Crisis." Once the broad goals had been set, a team representing the social sciences, natural sciences, and agriculture revised the course outlines for all courses in the required core program. A curriculum guide which considered the coordination issues of timing, sequence and context was developed. The "World Food Crisis" program received the support of the Carnegie Foundation supported Change in Liberal Arts Education Project. It was aimed at the liberal arts student seeking a broad understanding of contemporary social issues. The students who participated were older, on the average, than the traditional student at Mendocino. Many of them were actively involved in "back-to-earth" movements. The program proved as cost-beneficial as the rest of the college's activity in terms of weekly student and faculty contact hours. Pretest and posttest measures of personal growth in a "value-added" measurement revealed that program students made significant gains. Descriptions of the curriculum and copies of evaluation instruments are included. (KB)

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INTERDISCIPLINARY EDUCATION FOR NONTRADITIONAL STUDENTS:

A CASE STUDY IN CHANGE

U S DEPARTMENT OF HEALTH,
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Robert N. Wallen
Project Director
Mendocino College
Ukiah, California

Thomas F. MacMillan, Ed.D.
Project Planning/Evaluation
Mendocino College
Ukiah, California

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PREFACE

"Interdisciplinarity" has been planned in two ways in the Mendocino College project. First, a set of knowledge, skills and attitudes goals was developed around the theme of the "World Food Crisis." In this phase of project development, the nine member planning team of students, faculty members, Division Chairpersons and Administrators achieved consensus by use of a procedure called the "Delphi" techniques. Briefly, this procedure calls for possible goals or objectives to be given a numerical rating by members of the planning group, and, through a predetermined number of iterations of the process, those with specified group median and interquartile range values would be taken to represent group consensus.

Once the broad curriculum goals had been set, a planning team representing the Social Sciences, Natural Sciences, and Agriculture undertook to revise specific course outlines for all courses in the required "core" program. At the same time, a master schedule was developed to assure that related courses from the several disciplines would be scheduled during the same semester.

During the Summer session, 1975, a curriculum guide was developed for all courses in the Change Project Core. The planning involved in this guide was comprehensive in terms of context, sequence, and timing. The intent was that, for example, the Agronomy class could be taught in a sequence that could take advantage of the presentation of material in Physical Geography. Throughout, the attempt was made to reduce duplication of curriculum content. The staff continues to meet on an informal but regular basis to assure continuity in the planning process.

Interdisciplinary aspects are emphasized for students in the Project through field trips and guest speakers. All students and faculty members are invited and encouraged to participate in planned co-curriculum activities which supplement classroom and field aspects of the project.

"Interdisciplinarity" is, at Mendocino College: 1) a focus on a thematic curriculum plan; 2) development of common curriculum goals which incorporate all related disciplines; 3) consistent planning and sequencing of instructional activities.

I. BACKGROUND AND SETTING OF THE CHANGE PROJECT

A. Population Characteristics of Mendocino Community College District

Mendocino College was established in 1972 by a vote of the inland communities of Mendocino County, California. After one year of operation, the district was expanded by vote of Lake County to annex territory and form a larger district. In 1975-76, the College entered its third year of service as part of California's public Community College system. Temporarily, educational services are being provided in relocatable facilities on the Twelfth District Fairgrounds, Ukiah, California: in August each year we pack-up and move out until the Fair is concluded. The College is still in the process of looking for a permanent home. Current enrollment is 2,500 students, including 450 full-time day students, 300 part-time day students and 1,750 evening students enrolled in classes offered throughout Lake and Mendocino Counties.

Typical of many rural areas where the largest urban center is only a little over 10,000, the population is not growing significantly and many of the young people of Mendocino and Lake Counties leave the region to seek employment in other areas. Unemployment rates are currently running 17%, a new low from January's 28%.

To most of the population, higher education is a new opportunity. The Counties served have never had a college before. About 9% of the adults are 25 years of age or older in Mendocino County, and the college graduates, and about 10% have eight years or less of formal education. Career and occupational opportunities in the area are primarily in lumber and wood products (21%), trade (16%), services (12%), and agriculture (7%). Government and education employ an additional 17% of the labor force. Unemployment traditionally runs high because of seasonal fluctuations in lumbering and agriculture. The need or demand for higher education is relatively low because of the few vocations requiring postsecondary training.

Because of the rural nature of the area, relative low land costs and beautiful settings, the area has attracted many people seeking to develop an alternative life style. In a sense, it is a "back to the land" movement. The interaction between the traditional and the new community is generally peaceful and productive. The main area of controversy has been over the conformance of non-traditional, single and communal family housing to existing county building codes and health regulations.

There is also a sizable Pomo tribal population that has not been integrated into the traditional Anglo culture. The Pomos are very active, but not highly unified regarding their goals. Currently, there is a great interest in their own history and the young are returning to many of the almost forgotten arts and crafts and food preparations.

A final note on the setting of the project: because we are rather isolated from major population centers, many of our students attending our college have little concern for, or awareness of, the world community and our relationship to it. Therefore, it was hoped that our interdisciplinary approach to the World Food Crisis topic would broaden their perspective and instill new value of human brotherhood, not only locally, but for the world community.

B. Mendocino Focuses on Change in Liberal Education

In 1974, the College recognized the need for development of services to two new target populations: 1) The Liberal Arts student seeking to broaden his understanding of the significant social issues of contemporary society, and 2) the small landowner seeking to develop practical skills for sustenance, single-family production. The response to the needs of the first target population resulted in the development of an Interdisciplinary Liberal Arts program involving students in one year of intensive study and field experience related to the World Food Crisis. The World Food program received the support and assistance of the Change in Liberal Arts Education Project, sponsored nationally by the Carnegie Foundation and five associations representing all of higher education. Mendocino college is one of two public community colleges representing the two-year segment as a project institution in the Change Project. Through involvement in the Change Project, and planning curriculum development, and evaluation skills of the staff of Mendocino College have been strengthened and improved substantially.

C. Selection of the World Food Crisis

The World Food Crisis was selected as the theme for the curriculum for several reasons. First, it is a problem that is taken seriously by young people of college age. Currently, The United Nations estimates that over 1/3 of the world population receives insufficient calories; over 1/2 have insufficient protein; 2/3 of the 800 million children in the less developed countries of the "hunger belt" suffer from malnutrition. The World Food Conference in Rome was followed by many, with great interest, especially in rural and agricultural America. In California, a University of California Food Task Force published a major study of the particular relevance of the world crisis to California agriculture (Hungry World: The Challenge to Agriculture: University of California, July, 1974). In Mendocino County, several important resources are available to the College, including the Agricultural Field Station of the University of California at Hopland, the Biodynamic Gardening Project directed in Covelo by Alan Chadwick, and the University of California Agricultural Farm Advisors, Ukiah.

Thus, the interest of the students, the qualifications and interests of the staff, and the available resources in the County made the World Food Crisis an attractive and viable theme for an experimental project.

II. DEVELOPMENT OF PROJECT PLAN

A. Delphi Techinques to Arrive at Consensus

The specific procedure used to set curriculum goals at Mendocino College was the consensus techniques known as "Delphi". In essence, the Delphi method involves the use of questionnaires and other formal channels to accomplish controlled interaction among members of a decision making group. Delphi procedures have three features: (1) anonymity of individual responses, (2) controlled feedback, and (3) a defined statistical presentation of group responses. In a situation involving administration, faculty and students in a common planning venture, such a procedure is very valuable to assure openness to a wide range of opinions and feelings. One of the developers of the method, Dr. Norman Dalkey, has referred to Delphi as "A rapid and relatively efficient way to 'cream the tops of the heads' of a group of knowledgeable people".

The advantages of anonymity in the procedure include the sharing of responsibility entirely throughout the group without identifying the specific source of divergent opinion in the decision-making process. Anonymity further serves to release responses that may otherwise be inhibited through group pressure, particularly in open discussion. Finally, the use of anonymity serves to allow the group, through written anonymous responses and evaluations, to avoid "adversary" or "confronted" situations in which the resolution of conflict may be diverted from substantive issues.

The use of controlled feedback, particularly through several repetitions of rating questionnaires, serves to focus for the group the emerging definition of priorities as the sequence of iterations moves from the most general to the most specific levels. In the procedure used at Mendocino College, numerical ratings on a scale of 1 to 100 were applied to curriculum goals that has been nominated by all members of the planning team. The group was presented with median and inter-quartile range scores for each item, which served to illustrate the diversity of opinion within the group, and also showed the direction of consensus in each of three interations of the process.

In community colleges, the Delphi procedure has been used in a number of ways since the Committee on Research and Development of the California Community and Junior College Association sponsored a workshop on Delphi in 1971. Facilities planning, job specifications, institutional goals, curriculum plans, and effectiveness of programs have all been the object of Delphi consensus in the last five years. One particularly extensive study was conducted by the Northern California Community College Research Group to ascertain which vocational programs were perceived to be most effective (A Field Study to Determine Characteristics of Most Successful Vocational Education Programs: Shasta College, 1972).

In the Mendocino College project, the Project Planning Group was given an initial orientation to the formulation of curriculum goals. Members of the team were given a brief abstract from Bloom's Taxonomy of Educational Objectives to assist them in developing possible items for consideration. Three broad areas were defined for planning goals: Knowledge, Skills and Abilities, and Attitudes and Values. Following the initial orientation, the team members "brainstormed" possible items that could become curriculum goal statements for each of the three major headings. Throughout, the focus was maintained by asking the question, "What has this goal to do with the objectives of the project to develop in students a comprehensive understanding of the World Food Crisis and to provide a broad educational experience in the Liberal Arts?"

To facilitate the process, the team determined in advance that "concensus" on any goal would be operationally defined as "a median rating score of 75 on a scale of 1 to 100, with an inter-quartile range no greater than 50". The consensus of the group would be assessed in three interactions, or rounds, with feed-back to all members at the conclusion of each round. An open discussion of the final consensus list would be held at the end of the third round to assure that final agreement was firm and clear.

The same procedure was to be used for consensus in each of the three categories of discussion: Knowledge, Skills and Abilities, and Attitudes and Values. As a final step, the curriculum goals in all three categories were synthesized by the group as a basis for further development of specific instructional objectives in each of the related disciplines of the project. A faculty planning team was their assignment to develop an intergrated curriculum plan for the project.

B. Overview of Curriculum

After each of the knowledge goals had been determined, the planning group reviewed the existing curriculum offereings in the catalog to determine which courses related best to the goals. The one year core was then selected to best represent the 16 knowledge goals listed on the following page. We also determined that a number of courses in the three major curriculum divisions of the college should be included as electives to meet the needs of three categories of students enrolled in the project. First, transfer students with majors in Agriculture, Nutrition, and Food Services. Second, Liberal Arts Students who wish to engage in intensive study of the World Food Crisis with the vocational objective of assisting developing countries raise their agricultural, vocational and general economic level. Third, non-traditional students desiring more knowledge of intensive subsistence agriculture. Students of the first and third categories would take more electives in the Division of Science and Industry, while students in the second category with a major interest in the

social science and humanities would select electives from the Division of Social Science and Humanities.

To illustrate the planning process, the 16 Knowledge Goals are listed below. From these, and from three additional goals pertaining to skills and attitudes, the curriculum was built on existing course titles. Substantial revision in course content and sequence was made in order to assure that at the end of the one-year program, the students would have accomplished the following Knowledge Goals:

1. Knowledge of Labor-Intensive agricultural methods;
2. Knowledge of Basic Food Storage and Preservation Techniques;
3. Knowledge of the Biosphere as related to World Food Production;
4. Knowledge of the Principles of Nutrition;
5. Knowledge of Man as a Time-Binding Species (Arts, Music, Literature);
6. Knowledge of the Physical Properties of Soils, Climate, and other Crop Production Factors;
7. Knowledge of the Principles of Energy Conservation;
8. Knowledge of Man as a Community Species;
9. Knowledge of Man as an Ethical, Spiritual Creature;
10. Knowledge of basic problem solving techniques;
11. Knowledge of the Economics of World Food Supply;
12. Knowledge of the Psychological Factors affecting human behavior;
13. Knowledge of Small Animal Husbandry;
14. Knowledge of the Rural Arts and Technologies;
15. Knowledge of the principles and dynamics of social change;
16. Knowledge of non-occidental cultural perspectives

The resulting curriculum, with a required "core" and specified electives, looked as follows:

THE WORLD FOOD CRISIS CURRICULUM

ONE YEAR CORE

Agr. 1	Agronomy	3
Agr.19A	Vegetable Gardening Practices	2
Agr.19B	Vegetable Gardening Practices	2
Agr.60	Raising Small Animals	2
Geo. 1	Physical Geography	3
HLH 15	Foods and Nutrition	3
Geo. 2	Cultural Geography	3
Per.103	Developing Individual Potential	1
Pol. 3	International Relations	3

1

SCIENCE AND INDUSTRY ELECTIVES
(3 UNITS)

		Units
Agr. 3	Soils	3
Agr.80	Food Storage Preservation	2
Agr.48	Meats	2
Bio.49	Concepts of Biology	3
Bio.49L	Concepts of Biology/Lab	1
PSC 1	General Oceanography	3
Nrs.1	Environmental Science	3

2

SOCIAL SCIENCE/BUSINESS ELECTIVES
(3 UNITS)

		Units
AgBus41	Agricultural Economics	3
Ant.2	Cultural Anthropology	3
Hst.19	Asian History	3
Hst.20	History of Mexico	3
Pol.2	Comparative Government	3
Soc.1	Sociology	3

3

HUMANITIES/FINE ARTS ELECTIVES
(3 UNITS)

		Units
Com.1A	Public Speaking	3
*Eng.1A	Reading & Composition	3
Eng.44A	World Literature	3
*Eng.100	Fundamentals of English	3
Phl.5	Ethics	2
Phl.8	Religions of the World	3

9 Elective Units must be taken in addition to the one year core. A minimum of 2 units is required from each group of electives.

* Meets Associate of Arts Degree Requirements for Graduation.

C. Curriculum Planning

Summer Workshop to Develop Interdisciplinarity

Purpose of Workshop

The summer workshop was designed to develop an interdisciplinary workshop based on the core curriculum and knowledge goals of the Change Project. The workbook consists of laboratory exercises, field experiences, classroom problems, and library research for students of Geography (1:2), International Relations, Agronomy (1), Foods and Nutrition, Raising Small Animals, Vegetable Gardening Practices, and Developing Individual Potential, all centering on the question of food for a hungry world. Secondly, the teachers of the core curriculum were able to focus together on the theme. We discovered and eliminated duplication of instruction. Course content was not only revised but the time schedule and instructional sequence for each course was re-evaluated to insure continuity. We found it most exciting to discover the interrelatedness of knowledge held sacred too long by various disciplines. For the first time at Mendocino College, a geographer, entomologist, agronomist, economist and agriculturalist shared and coordinated their interest. Thirdly, the workshop provided needed time to plan a series of field trips and invite speakers of international reputation to come to Mendocino College during the project's first year. Included in the appendix is a list of speakers and field trip experiences.

Approach

The approach used involved a team effort and coordination between the Liberal Arts, Natural Sciences, and Agriculture, with the team consisting of Robert Wallen, Social Sciences; Gus Shackelford, Social Science; Doug Puckering, Agriculture and Nutrition; Tony Latronica, and Edward Schwabe, Agriculture; and Tom MacMillan, Evaluation and Counseling.

The materials in the workbook were developed in a cooperative manner in order to insure continuity and minimum of duplication. Time of delivery of materials to students was also planned in order to insure the maximum instruction effectiveness.

The workbook was subdivided by topics, without course titles, into the following topics:

Animals
Plants
Earth Resources
Weather and Climate
Nutritions
Man and Culture
Developing Human Potential

This organizational approach was intended to help reinforce the interdisciplinary concepts stressed in The World Food Crisis theme.

The Summer planning research time was divided in the following manner: writing of the materials for students; on-site visits for future field trips to the places listed under Field Trips; contacting and interviewing speakers for the coming year.

During this workshop period, selection and production of A-V materials and a one-minute T.V. announcement for Bay Area T.V. was completed. Also, a complete bibliography was developed dealing with the topic of food and hunger.

III. PRELIMINARY STRATEGIES FOR EVALUATION

Several promises were made as the Mendocino College project was conceptualized. Stated or implied in the original document were strong commitments to develop a Liberal Arts curriculum that would be interdisciplinary and thematic in content, responsive to "non-traditional student" needs and interests, and cost-beneficial from the criterion references of faculty and student load and performance. Earlier sections of this paper have reported the process of curriculum development, and have indicated the interdisciplinary nature of the World Food Crisis curriculum. In this section, attention is given to the questions of student characteristics, program operation (cost benefit), and program outcome (human development).

A. A Curriculum for "Non-Traditional Students"

Mendocino County has been the scene of social change during the past five years. Spurred by an interest in returning to the land, and deeply committed to an environmental ethic emphasizing minimum intervention in natural processes, literally hundreds of people have come to find their "forty acres and independence". As these new citizens of the County have confronted survival issues, they have organized to seek orderly social change, particularly in the application of Building Code and Public Health standards for owner-occupied housing. Through United Stand, a socially and politically active advocate organization, many of the objectives have been achieved. In this context of social change, the World Food Crisis curriculum was designed to contain both the theoretical and the applied: Gardening, Small Animal Husbandry, and Food Preservation courses were balanced by Geography, Nutrition, Agronomy and International Relations.

In its recruitment processes, the College was successful in attracting the "non-traditional" student. Courses were arranged on a two day per week schedule to allow students the convenience of minimum travel requirements. Of 29 applicants to participate in the project, 12 were already involved actively in a "back to the land" movement. Several were living in communities some 5 to 10 miles off paved road; at least one was an apprentice to Alan Chadwick, learning Bio-dynamic Gardening techniques from this famed Horticulturist. Two students arrived on campus by accident as hitchhikers up Highway 101 during the Summer of 1975. Another two students moved into the area from another community and set up a home in a tent at the Lake Mendocino Campground, where they remained for two months during the first semester of the Project. When enrollment was completed, there were 17 students in the Project for t least two courses.

There were other evidences that this was not a "traditional" student population. The first table below shows a comparison of ages between Change Project and total enrollments for the Fall, 1975 semester. A second table shows the prior units of

college work completed by Change Students, as compared with the total enrollment.

AGE DISTRIBUTION FALL 1975

CHANGE PROJECT VS TOTAL DAY STUDENTS
(In Percentages)

	Total Day Enrollment (N=1006)	Change Project (N=17)
Under 21	28%	12%
21 - 29	36%	47%
30 and above	36%	41%

PRIOR UNITS COMPLETED BEFORE FALL 1975

CHANGE PROJECT VS TOTAL DAY STUDENTS
(In Percentages)

Prior Units	Total Day Enrollment (N=1006)	Change Project (N=17)
Freshmen (0-29)	68%	41%
Sophomores (30-59)	22%	47%
Others (60+)	10%	12%

In addition to lifestyle commitments that differentiate the Change Project students from others on campus, it is evident that they were older and had completed more college semester units. Of the 17 students taking at least two courses in the Project, 14 were either first-time transfer students in Fall, 1975, or had completed college work at another institution before entering Mendocino College.

B. Activity Measures and Cost Benefit Analysis

A second major commitment of the Project was that, compared with the total campus operations, the experimental program would compare favorably. The principal indicators of activity used at Mendocino College are Weekly Student Contact Hours (WSCH) and Weekly Faculty Contact Hours (WFH). Using these two activity measures, it is possible to calculate the WSCH/FTE (Full-time equivalent) faculty ratio for the whole college, and for special programs.

To make this analysis, the total enrollment in all four (4) of the "core" classes in the World Food Crisis curriculum was considered. While not all students were enrolled in all four of the core classes, 17 were enrolled in at least two. In addition, the specially developed courses were open to other students on campus who were interested in studying a particular discipline from the thematic perspective of the Project. The summary of activity appears below.

WEEKLY STUDENT CONTACT HOURS
&
WEEKLY FACULTY CONTACT HOURS

FALL 1975 CHANGE PROJECT "CORE"

CORE COURSES	WSCH	WFH	FTE	WSCH/FTE
Foods and Nutrition	90	3	.20	450
Soils	115	5	.28	411
Vegetable Gardening	64	4	.22	291
Physical Geography	69	3	.22	314
TOTALS	338	15	.92	367
COLLEGE TOTALS FALL 1975	18679	--	53.74	348

The Change Project at Mendocino College, then, was demonstrably as "Cost-Beneficial" as the remainder of College activity in terms of the WSCH/FTE ratio measurement. Because costs are allocated to disciplines in the California Community College Accounting System, a second step in he evaluative process on campus could be the actual dollar allocation for Project activity. In this phase, a "Cost per WSCH" ratio could be developed for future projection or Cost/Benefit inquiry.

C. Measure of Output: Concept of "Value-Added"

One of the major weaknesses in Educational Evaluation is the apparent gap between the ability of the researcher to identify easily quantifiable measures of activity and his ability to develop quantifiable measures of outcome. For this reason, stress is placed on such "outcomes" as "persistence" and "grade point average". Tests of the significance of difference between the Change Project student attrition and total college student attrition for Fall, 1975 showed that, although attrition ("W" grades) among the Change Project students was about 5% higher than for others, the difference was not statistically significant.

In the interest of improving evaluation strategies for experimental projects at Mendocino College, the evaluator developed a student self-reporting instrument to measure educational "Value-Added" during the Project. Since the Project Planning team had developed three lists of curriculum goals under the headings "Knowledge", Related Skills" and "Attitudes/Values", it was decided that students in the Project should have the opportunity to reflect on what changes, if any, had occurred during their experience in the core curriculum. An instrument was developed for the purpose, and is attached to this paper as an appendix.

The methodology selected to measure "Value-Added" was to consider each section of the test as a Likert-Type scale; to sum the scores for each student under the headings of "Knowledge", "Skills" and "Attitudes", and to analyze the significance of the pre-and-post measures of personal growth by an appropriate statistical procedure for related measures.

To illustrate the effectiveness of this strategy, a formative evaluation for 9 continuing students enrolled in Cultural Geography course, Spring, 1976 is shown below. For each of the scales, the theoretical minimum score would be zero (0). The maximum possible score for each scale would be as follows: Knowledge, maximum = 75; Related Skills, maximum = 95; Related Attitudes/Values, maximum = 130.

SELF-REPORTED CHANGES IN STUDENT KNOWLEDGE, SKILLS AND ATTITUDES:

FORMATIVE EVALUATION, SPRING 1976

SCALE	PRE-ENROLLMENT ASSESSMENT (Mean)	CURRENT ASSESSMENT (Mean)	DIFFERENCE	T-SCORE
Knowledge	24.33	43.89	19.56	10.99 p<.01
Skills	46.89	62.89	16.00	4.89 p<.01
Attitudes	101.44	124.22	22.78	4.15 p<.01

For each self-reporting scale, the Change Project students showed statistically significant gains. The Value of the strategy is both general and specific. As an indication of overall program effectiveness, the summed scores provide a useful measure. For curriculum review, an item analysis can be made to ascertain whether students perceive that they had "Not Studied" content under the knowledge heading, or whether there had been relatively smaller gains reported for a specific item, as compared to the overall gain.

IV. "CHANGE 1976-77" A MULTI-LEVEL CURRICULUM

The experience of the past three years has suggested the need for integrated planning of a three-phase curriculum in Agriculture to serve

..... Transfer needs - for majors in Agriculture, Nutrition and Food Sciences

..... Liberal Arts needs for non majors who wish to engage in intensive study of the World Food Crisis

..... Small Farm Technology Needs - for applied training in sustenance-level Agriculture appropriate to the region.

Since the enrollment of Mendocino College is small, it is essential that the multi-phase curriculum be developed in such a way that several outcomes can be assured:

1. Learning objectives must be established that will allow students to pursue different levels of educational goals.

2. The curriculum should be planned to include a balance between field and classroom components related to established curriculum objectives.

3. The curriculum should be cost beneficial in terms of faculty-student ratios, weekly student contact hours.

4. The curriculum should be interdisciplinary, to allow students to achieve Liberal Arts, General Education objectives as well as transfer or vocational objectives.

TENTATIVE STATEMENTS OF GOALS

To complete the development of the proposed multi-phase curriculum, three categories of goals must be achieved:

1. Staff development - the creation of interdisciplinary teaching teams to prepare curriculum outlines and develop teaching materials appropriate to the three curriculum goals of the proposed plan. (Transfer, Liberal Arts, Vocational-Technical)

2. Instructional Equipment, Supplies - The identification and acquisition of instructional equipment and materials to allow for maximum individualization of learning for students with diverse academic preparations and educational goals.

3. Field Station Development - the acquisition and development of a Agricultural Field Station to be used to illustrate the application of skills and principles at the three levels of the proposed plan.

It is anticipated that the achievement of these goals could be accomplished in a two year period, beginning in the 1976-77 academic year.

PROPOSED PROJECT OUTCOMES

At the conclusion of the two-year project period, Mendocino College would be able to share with the higher educational community:

..... Complete documentation of the planning processes and strategies used in the development of curriculum objectives.

..... A complete statement of curriculum goals pertaining to Agriculture, Food Production, and Small Farm Technology.

..... A complete set of curriculum guides reflecting the multi-phase emphasis of the proposed curriculum.

..... A complete documentation of the evaluative procedures, measurement of curriculum goals, student persistence and performance data, and cost-benefit analytical procedures applied to the project.

Additional curriculum review could be encouraged by administering a similar instrument to faculty members to inquire how much "stress" was placed on a given item, "how important" the item was in the total curriculum or program plan.

Evaluation of the Project at Mendocino College has been conceived on three dimensions: Student Characteristics (input variables); Activity Measures (activity variables); and "Value Added" (output variables). The importance of the evaluative strategy, perhaps, is that it attempts to raise and answer questions concerning the "Value Added" dimension of educational outcomes. Every attempt has been made to achieve an active and continuous process of assessment in the Project. Hopefully what has been learned at Mendocino College may be of value to others as they plan for evaluations on their own campuses.

V. APPENDIX

Required Materials:

A. Course Workbook: The workbook is to be used in each of the core courses you have selected. During the summer of 1975, teachers of the core curriculum developed materials directly related to the knowledge goals of the project. We have included a variety of laboratory experiences, field trips, study questions as well as background information on the specific topics. As you preview the worksheets, keep the following thoughts in mind about each sub-heading on the worksheet. The first sub-heading: Introduction, is a brief description of the topic and it includes background information needed to complete the assignment. The sub-heading: Change, is the objective or goal for you to achieve. References, are provided to give additional information or lead you to the objective more effectively. The term Experiences, represents the tasks to be performed by the student to insure reaching the objective. Finally, Measurement of Change, is a sample of the type of question you should be able to answer after completing the assignment.

The workbook is not divided by courses, but by topics. The team feels the theme so frequently cuts across traditional subject matter boundaries that course titles are less important.

B. Goodes World Atlas, Hammond. Each student in the project is expected to purchase this atlas. It is referred to continually in the workbook and will be of great value as a general resource in the core courses.

C. A Hungry World, University of California. Food Task Force. A Hungry World represents a study recently conducted by the University of California Food Task Force, on the world food crisis. In a sense, this is our bible of background statistics related to the food oriented problems of the world. A must for each student of the project.

CHANGE PROJECT

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2. Social Organizations
3. International Trade
4. The Nation-State
5. Population Growth
6. Population Patterns
7. Nature and Culture
8. Patterns of Agricultural Settlement
9. The Geography of Hunger and Disease
10. Cultural Regions
11. The Cultural vs. Natural Landscape
12. The Law of Diminishing Returns
13. Politics of the Food Crisis
14. Imperialism
15. The Geography of Food Distribution

B. WORLD RESOURCES AND THE EARTH

1. Can We Have Energy and Eat It Too?
2. Rocks, Minerals, and Man
3. Surface of the Earth
4. Topographic Maps
5. Agricultural Resources of the Earth
6. The Earth's Motions
7. Weathering of Rocks

C. PLANT PRODUCTION

1. Gross Plant Anatomy
2. Production Cost Analysis
3. Roots and Systems
4. Seeds and Seedling Anatomy
5. Crop Reports
6. Growing Season Factors and Crop Patterns
7. Seed Purity Analysis
8. Weed Identification and Control
9. Leaves

10. Flowers and Parts
11. Fertilizers
12. Testing for Nitrogen, Phosphorus, and Potassium
13. Land Preparation
14. Composting
15. Planting and Transplanting
16. Companion and Moon Phase Planting
17. Insect Identification and Control
18. Soils - Physical Properties
19. Soils - Chemical Properties
20. Soil Forming Processes
21. Soil Patterns of the Earth
22. The Geography of Plants
23. Environmental Factors and Plants
24. Plant Identification, Vegetables and Fruits
25. Harvesting Procedures
26. Irrigation
27. Pruning
28. Vegetable Utilization in the Home

D. SMALL ANIMAL PRODUCTION

1. Milk Production
2. Goat Diseases
3. Management Practices
4. Catfish Farm Management
5. Feeding Dairy Goats
6. Rabbit Breeding Systems
7. Marketing and Slaughtering
8. Breeding and Selecting Dairy Goats
9. Purchasing Goats
10. Layer Production
11. Brooder Construction
12. Butchering and Processing Poultry
13. Feeding Poultry
14. Poultry Diseases and Pest Control
15. Fryer Production
16. Selecting Breeds of Rabbits for Meat Production
17. Incubator Construction

E. FOODS AND NUTRITION

1. Minimum Daily Requirements
2. Food Plant Nutritional Value
3. Dietary Protein Analysis
4. Digestive System
5. Food Additives

TABLE OF CONTENTS (continued)

F. WEATHER AND CLIMATE

1. Climate and Middle and High Latitudes
2. Climate and Wet and Dry Tropics and Agriculture Patterns
3. Daily Weather Map
4. Micro-Climate in Agriculture
5. Clouds - Sign Posts Aloft
6. Hydro-Logic Cycle
7. Ocean of Air

FIELD TRIPS

During this year of intensive study, the team has planned a number of Field Trips for first-hand observation of many of the topics listed in the curriculum.

Listed below are the topics, dates, and places to be visited during the year. It is the philosophy of the planning team that each student be exposed to research, applied technology, and actual field experience. Therefore, the places selected represent a cross-section of topics, methodology, and application.

DATES	GUIDE	PURPOSE	PLACE
September	Wallen	View of the Biosphere	Mendocino Highlands Coastal Plains Russian Gulch State Park
October	Puckering	Colusa Rice Harvest Fish Production	Colusa
October	Latronica	Biodynamic Gardening	Covelo
November	Wallen	Energy Source and Cultural Perspectives	The Gysers San Francisco - P.G.&E. and China Town
February	Latronica	Research in Food Production	Hopland Field Station University of California
May	Latronica	Subsistance Agriculture	Willits

CHANGE PROJECT

GUEST SPEAKERS

In California, we are fortunate to have abundant educational and scientific resources available to us. The planning team has sought to bring to the Project the very best resources in the state, representing a wide spectrum of philosophies, backgrounds, and objectives. Yet, they all have one thing in common with Mendocino College - we are committed to improving the material, social, and spiritual environment of humanity.

Listed below are the speakers:

DATE	SPEAKER	MODERATOR	TOPIC
October 3-4 1975	ROBERT LARSON World Vision, Inc.	Robert Wallen	"THE WORLD'S HUNGER BELT"
October 8 1975	ALLEN CHADWICK Intensive Gardner	Tony Latronica	"FRENCH INTENSIVE Bio-dynamic Gardening"
November 12 1975	LOU MCREE P. G. & E.	Robert Wallen	"CURRENT ENERGY ALTERNATIVES"
December 5 1975	CHARLES BARROWS	Bill Wheeler/ Student	"THE FOOD CRISIS- S.E. ASIA"
February 1976	DR. COLLINS American Farm Bureau	Tony Latronica	"MARKETING,DISTRI-BUTION OF AGRICULTURE"
February 1976	JESS TIDWELL Rincon-Vitova	Doug Puckering	"BIOLOGICAL & CULTURAL PEST CONTROL"
March 10 1976	JAN DAMMULLER Mendocino College	Doug Puckering	"EUROPEAN INTENSIVE AGRICULTURE"
April 21-22 1976	DR. DANIEL G. ALDRICH Chancellor, UC, Irvine, Chairman: National Science Foundation Food Committee	Robert Wallen	"WORLD HUNGER AND THE UNITED STATES ROLE"
May 1976	CHARLES BARROWS	Robert Wallen	"FOOD CRISIS PHILIPPINES"
May 6,7	DR. C. DEAN FEUDENBERGER School of Theology Claremont Mens College	Robert Wallen	"SOCIAL AND MORAL IMPLICATIONS OF HUNGER"

AGRICULTURAL RESOURCES OF THE EARTH

INTRODUCTION

Agricultural resources vital to the fertilization of crops are unevenly distributed across the face of the earth. For example, the United States, Soviet Union, and Horocco produce nearly 80 percent of the world's phosphate. Over 80 percent of the world's potash comes chiefly from the Soviet Union, Canada, the United States, and East and West Germany. Sulfur is chiefly mined in the United States, Canada, and Mexico. Therefore, one can see a wide gap between the richly endowed countries and the rest of the world.

Since agricultural production in terms of high yields per acre at minimum labor cost is the economic practice in the United States and is becoming a standard throughout the world, mineral fertilizers are of great importance in maintaining this method of agriculture.

The bulk of fertilizers in this country consists of nitrogen, phosphoric acid, and potash. Of these three, nitrogen appears to produce the quickest results. It gives the plant a luxuriant dark green color. Nitrogen is a constituent of protein and is thus a part of every living plant cell. When a soil is poor in nitrogen, plants do not grow large and usually have a poor color. They appear drought striken.

Phosphoric acid derived from phosphate, hastens maturity of crops and aids in the transfer of substances from the stalk, leaves, and other growing parts to the seed, making the grains plump and full. It also stimulates root development, and increases the plants resistance to disease. In some soils this is the limiting factor in crop production than any other plant nutrient.

Potash appears to aid the plant in resisting certain diseases, increases the formation of starch, sugar, and cellulose, and where it is insufficient, plants do not mature well. Root crops respond well to potash fertilizers and fail to do so when not enough potash is available.

Sulfur is contained in amino acids which becomes a part of certain proteins. Sulfur deficient soils are not common. Sulfur's major use in agriculture is in the form of a contact poison. Sulfur dust is toxic to mites, chiggers, red spiders, trip. It also is important as a fungicide.

CHANGE

After completing this exercise, you should be able to identify the general patterns of distribution of nitrogen, sulfur, potash, and phosphate minerals. Explain the significance of nitrogen, phosphate, sulfur, and potash, for the health of plants.

REFERENCES

1. Strahler, Introduction to Physical Geography, Chapter 14.
2. B. T. Bunting, The Geography of Soil.
3. Goode's World Atlas

EXPERIENCE

Using Goode's World Atlas, page 47, locate the countries in the world producing the bulk of the following fertilizers and give the percent produced.

	COUNTRY	%
A. Phosphate		
B. Potash		
C. Sulfur		
D. Nitrogen		

MEASUREMENT OF CHANGE

Describe the general patterns of mineral fertilizer production for phosphate, potash, sulfur, and nitrogen and explain the significance of each nutrient to plant vigor.

CHANGE PROJECT: STUDENT DEVELOPMENT ASSESSMENT

Please help us evaluate the educational experience you have had so far in the Change Project by completing the attached questionnaire.

On the five attached pages there are spaces for two reactions. In the left column, please indicate your knowledge, skill, or attitude prior to your enrollment at Mendocino College. In the right hand column, please indicate your current level of knowledge, skill, or attitude. Naturally, some things may have changed; others may not have changed.

Thank you for helping us to measure your educational and personal growth as a Change Project Student. For the sake of assuring that we have all available data, please put your name at the bottom of this page.

NAME _____

KNOWLEDGE GOALS: MENDOCINO COLLEGE

Prior Level of Knowledge								Current Level of Knowledge					
None	Little		Some		Much			Not Studied	Little		Some		Much
0	1	2	3	4	5	(1)	Knowledge of the Biosphere as related to Food Production.	0	1	2	3	4	5
0	1	2	3	4	5	(2)	Knowledge of basic principles of Nutrition.	0	1	2	3	4	5
0	1	2	3	4	5	(3)	Knowledge of Man as a Community Species. (cultural, social patterns)	0	1	2	3	4	5
0	1	2	3	4	5	(4)	Knowledge of Problem Solving techniques, methods.	0	1	2	3	4	5
0	1	2	3	4	5	(5)	Knowledge of the Economics of World Food Supply.	0	1	2	3	4	5
0	1	2	3	4	5	(6)	Knowledge of basic psychological factors affecting Human Behavior.	0	1	2	3	4	5
0	1	2	3	4	5	(7)	Knowledge of Small Animal Husbandry Practices.	0	1	2	3	4	5
0	1	2	3	4	5	(8)	Knowledge of basic principles of Rural Technologies.	0	1	2	3	4	5
0	1	2	3	4	5	(9)	Knowledge of the principles and dynamics of Social Change.	0	1	2	3	4	5
0	1	2	3	4	5	(10)	Knowledge of Labor-Intensive Agricultural Methods.	0	1	2	3	4	5
0	1	2	3	4	5	(11)	Knowledge of Basic Food Crop Production Techniques for Small Consumption.	0	1	2	3	4	5
0	1	2	3	4	5	(12)	Knowledge of the Physical properties of soils, climate and other factors affecting crop production.	0	1	2	3	4	5
0	1	2	3	4	5	(13)	Knowledge of Food Storage and Preservation Methods.	0	1	2	3	4	5
0	1	2	3	4	5	(14)	Knowledge of Cultural-Social Values systems in Western and Non-Western Cultures.	0	1	2	3	4	5
0	1	2	3	4	5	(15)	Knowledge of the Principles of Alternative Energy Sources, Methods.	0	1	2	3	4	5

RELATED SKILLS: MENDOCINO COLLEGE

Prior Level of Skills								Current Level of Skills					
None	Little		Some		Much			Not Studied	Little		Some		Much
0	1	2	3	4	5	(1)	Ability to interpret seasonal changes.	0	1	2	3	4	5
0	1	2	3	4	5	(2)	Ability to read and interpret data. (statistical, topographic)	0	1	2	3	4	5
0	1	2	3	4	5	(3)	Ability to maintain personal health.	0	1	2	3	4	5
0	1	2	3	4	5	(4)	Ability to perform basic food preservation and storage skills.	0	1	2	3	4	5
0	1	2	3	4	5	(5)	Rural arts and crafts skills performance.	0	1	2	3	4	5
0	1	2	3	4	5	(6)	Ability to communicate effectively in spoken and written language.	0	1	2	3	4	5
0	1	2	3	4	5	(7)	Ability to transmit skills, knowledge, values, attitudes to others.	0	1	2	3	4	5
0	1	2	3	4	5	(8)	Ability to perform simple to complex problem solving and analysis skills.	0	1	2	3	4	5
0	1	2	3	4	5	(9)	Ability to perform basic mechanical tasks for the maintenance of small farm equipment.	0	1	2	3	4	5
0	1	2	3	4	5	(10)	Ability to perform basic calculation skills.	0	1	2	3	4	5
0	1	2	3	4	5	(11)	Ability to identify and utilize physical, human, and political resources.	0	1	2	3	4	5
0	1	2	3	4	5	(12)	Ability to accomplish personal maintenance in the absences of accepted creature comforts.	0	1	2	3	4	5
0	1	2	3	4	5	(13)	Ability to identify the political realities of the community, state, nation and to effectively influence legislative processes.	0	1	2	3	4	5
0	1	2	3	4	5	(14)	Ability to identify and implement the process of conflict resolution.	0	1	2	3	4	5
0	1	2	3	4	5	(15)	Ability to implement a process of identification of community needs, and to develop objectives and procedures to respond to those needs.	0	1	2	3	4	5

RELATED SKILLS: MENDOCINO COLLEGE

Prior Level of Skills								Current Level of Skills					
None		Little		Some		Much		Not Studied	Little		Some		Much
0	1	2	3	4	5	(16)	Ability to plan and set meaningful personal and community goals.	0	1	2	3	4	5
0	1	2	3	4	5	(17)	Ability to perform basic animal husbandry skills from propagation to table preparation.	0	1	2	3	4	5
0	1	2	3	4	5	(18)	Ability to perform simple construction tasks related to gardening.	0	1	2	3	4	5
0	1	2	3	4	5	(19)	Ability to care for and maintain farm implements and tools.	0	1	2	3	4	5

RELATED ATTITUDES/VALUES: MENDOCINO COLLEGE

Prior Level of Attitude (No Concern → Much Concern)							Current Level of Attitude (No Concern → Much Concern)						
0	1	2	3	4	5	(1) Reverence for life in its diverse forms.	0	1	2	3	4	5
0	1	2	3	4	5	(2) Attitude of relationship to man, plants, animals that considers them beyond their economic importance.	0	1	2	3	4	5
0	1	2	3	4	5	(3) Sensitivity is the process of change in nature.	0	1	2	3	4	5
0	1	2	3	4	5	(4) Enhancement of joy in the natural, social environment.	0	1	2	3	4	5
0	1	2	3	4	5	(5) Appreciation and development of the creative potential in each person.	0	1	2	3	4	5
0	1	2	3	4	5	(6) Appreciation of the aesthetic qualities of nature and its artistic representation.	0	1	2	3	4	5
0	1	2	3	4	5	(7) Enhancement of contemplative, meditative, intuitive potentials.	0	1	2	3	4	5
0	1	2	3	4	5	(8) Respect for intellectual, moral, ethical authority.	0	1	2	3	4	5
0	1	2	3	4	5	(9) Appreciation of humor; development of the capacity of enjoyment.	0	1	2	3	4	5
0	1	2	3	4	5	(10) Attitude of focus on the completing a task: Perseverance.	0	1	2	3	4	5
0	1	2	3	4	5	(11) Respect for the consequences of intervention in natural processes.	0	1	2	3	4	5
0	1	2	3	4	5	(12) Enhancement of caring, concern for other persons.	0	1	2	3	4	5
0	1	2	3	4	5	(13) Respect for the attitudes and values of others.	0	1	2	3	4	5
0	1	2	3	4	5	(14) Development of a sense of community relatedness among members	0	1	2	3	4	5
0	1	2	3	4	5	(15) Development of personal freedom to assert and live by personal values.	0	1	2	3	4	5
0	1	2	3	4	5	(16) Attitude of open-mindedness; remaining open to new ideas and values.	0	1	2	3	4	5

RELATED ATTITUDES/VALUES: MENDOCINO COLLEGE

Prior Level of Attitude (No Concern → Much Concern)								Current Level of Attitude (No Concern → Much Concern)						
0	1	2	3	4	5	(17)	Clarity and integrity of personal values.	0	1	2	3	4	5	
0	1	2	3	4	5	(18)	Development of cooperative rather than competitive modes of relationships with others.	0	1	2	3	4	5	
0	1	2	3	4	5	(19)	Respect for the value of work and personal achievement.	0	1	2	3	4	5	
0	1	2	3	4	5	(20)	Appreciation of the role each person has as "curator" of the future.	0	1	2	3	4	5	
0	1	2	3	4	5	(21)	Enhancement of the capacity of honesty in relationships.	0	1	2	3	4	5	
0	1	2	3	4	5	(22)	Acceptance and understanding of one's own limitations.	0	1	2	3	4	5	
0	1	2	3	4	5	(23)	Development of positive values, attitudes in each individual.	0	1	2	3	4	5	
0	1	2	3	4	5	(24)	Development of sensitivity to, control of, negative emotions.	0	1	2	3	4	5	
0	1	2	3	4	5	(25)	Development of the attitude of patience in accomplishing tasks.	0	1	2	3	4	5	
0	1	2	3	4	5	(26)	Development of the capability to deal with confrontations productively.	0	1	2	3	4	5	